

ENERGY ELEMENT
OF THE
GENERAL PLAN
1976-2000

CITY OF LIVERMORE
COUNTY OF ALAMEDA

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ADOPTED BY

CITY COUNCIL

RESOLUTION NO. 93-79 April 9, 1979

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City Council Policy Regarding Conservation, August 1, 1977

STATE OF NEW YORK

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I. Introduction

The United States is anticipating a shortage of fuel and energy. The means to cope with this projected shortage is reducing demand, improving existing processes of energy use, and finding and utilizing new energy sources. Although this problem is global in nature, action must and can be taken at the local level to insure efficient energy use and a reduction in per capita demand.

The purpose of this element is to provide guidance and encouragement for citizen and governmental action in energy conservation and use of alternate resources.

Background information is presented that identifies current resources and uses, and defines the projected problem. Conservation measures and alternate resources are discussed and action and policy guidelines and proposals are presented.

II. Background

Figure 1 depicts the basic energy problem. Fossil fuels specifically gas and oil, will be depleted faster than new sources of these fuels can be found or developed. Figure 2 depicts the status of the U. S. energy balance--where it comes from and where it goes--and by comparing rejected (lost) energy with utilized energy, gives some relative idea as to the magnitude of energy savings possible with improvements in efficiency.

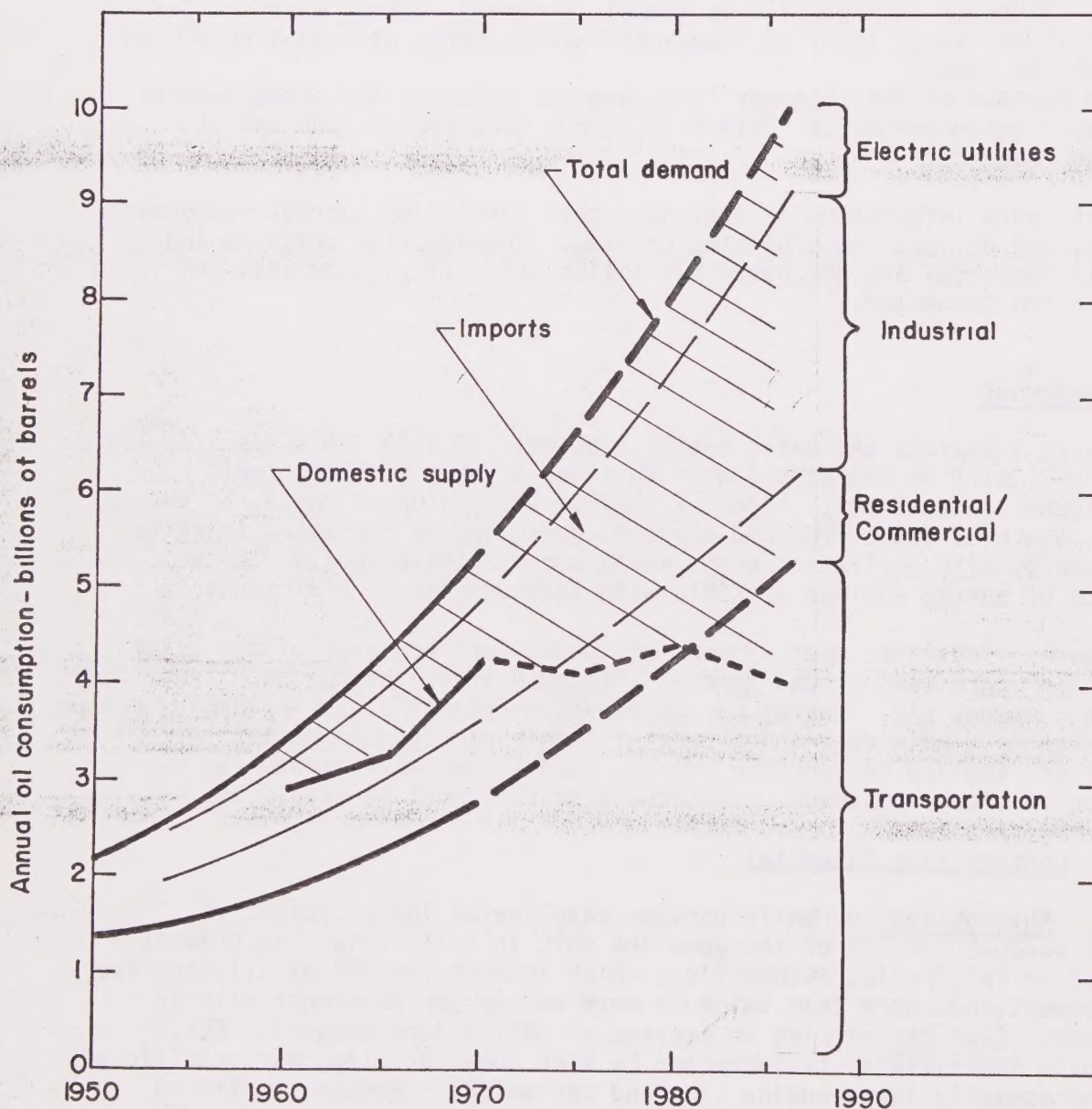
Figure 3 indicates each segment of society and how much of the total energy "pie" each uses in California. Figure 4 indicates how each individual "eats" his energy pie. Energy use conservation potential for Livermore can be established by simply describing current levels of use. No matter what measures are applied to conserve energy, however, we will eventually run out of conventional reserves. Alternate sources must be developed.

A. Conservation Potential

Automobiles currently consume gasoline at low efficiencies and account for 75% of the gasoline sold in California. As presently used in California, automobiles, which account for 90% of all passenger movement, use more than twice as much energy per passenger mile as buses. Each car carries an average of only 1.3 passengers. Automobile inefficiency is increased by high speed driving, air conditioners, unnecessarily large engine size and car weight. Remote, scattered, or low-density housing developments not only increase dependence on automobiles, but also tend to require greater travel distances causing air pollution and fuel consumption. This is particularly true of Livermore, where adequate employment opportunities often require commutes of 40 to 100 miles per day.

Space Heating and Cooling accounts for more energy use in the residential/commercial sector than any other single factor. Up to 50% of the heating and cooling demand is a result of a building's inability to retain its heated air in the winter or its cooled air

U.S. PETROLEUM SUPPLY & DEMAND (including Natural Gas liquids)



Data source :

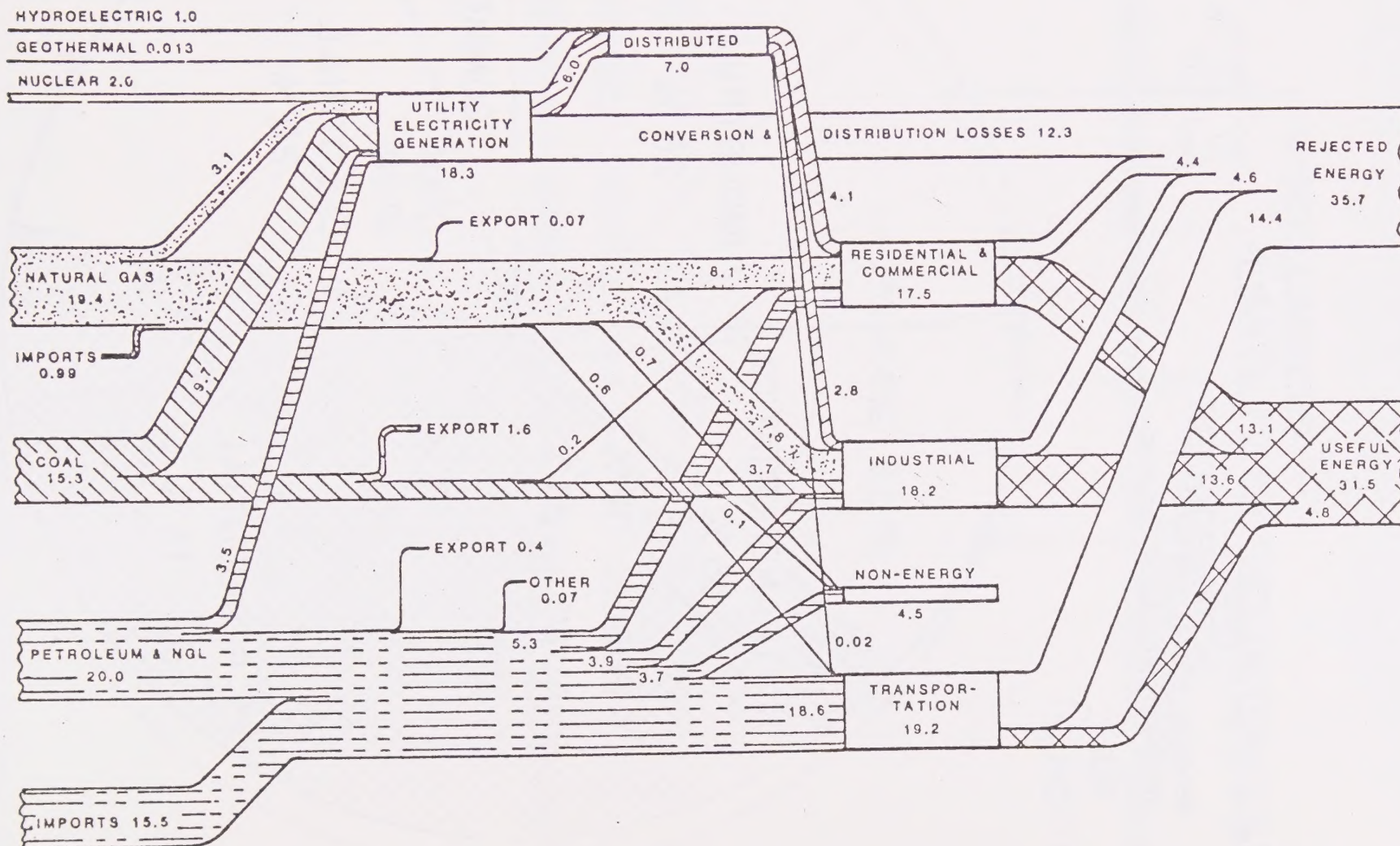
U.S. Outlook for Energy - An Initial Appraisal 1971-1985, Vol. I
National Petroleum Council, Washington, D.C.
November 1971

U.S. ENERGY FLOW-1976

(PRIMARY RESOURCE CONSUMPTION 72.1 QUADS)

Data Source:

LLL - William J. Ramsey

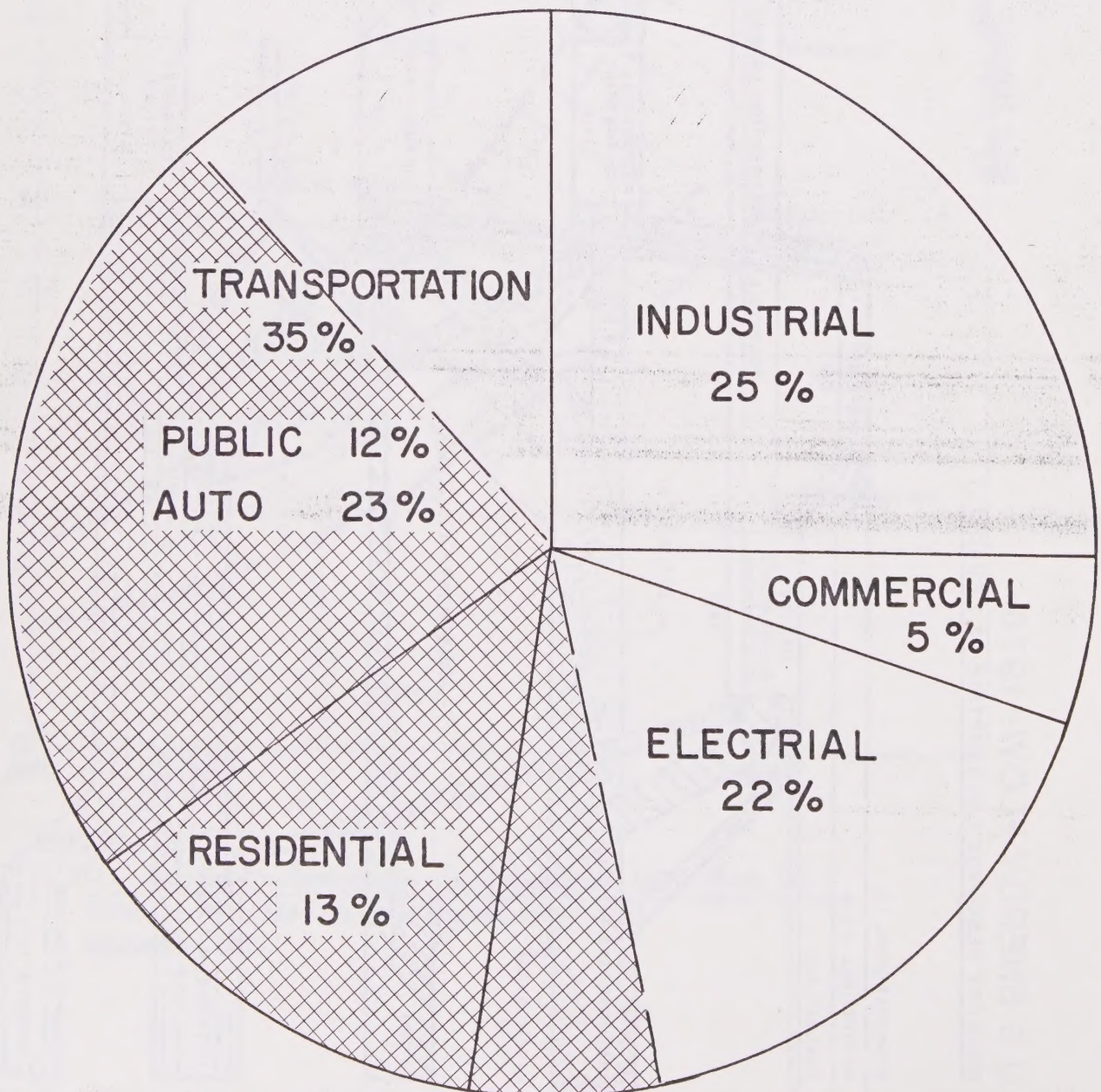


Note: 1 Quad = 1,000,000,000,000,000

California's Energy Pie

42% of pie is shaded,
denoting energy use directly
affected by personal decision

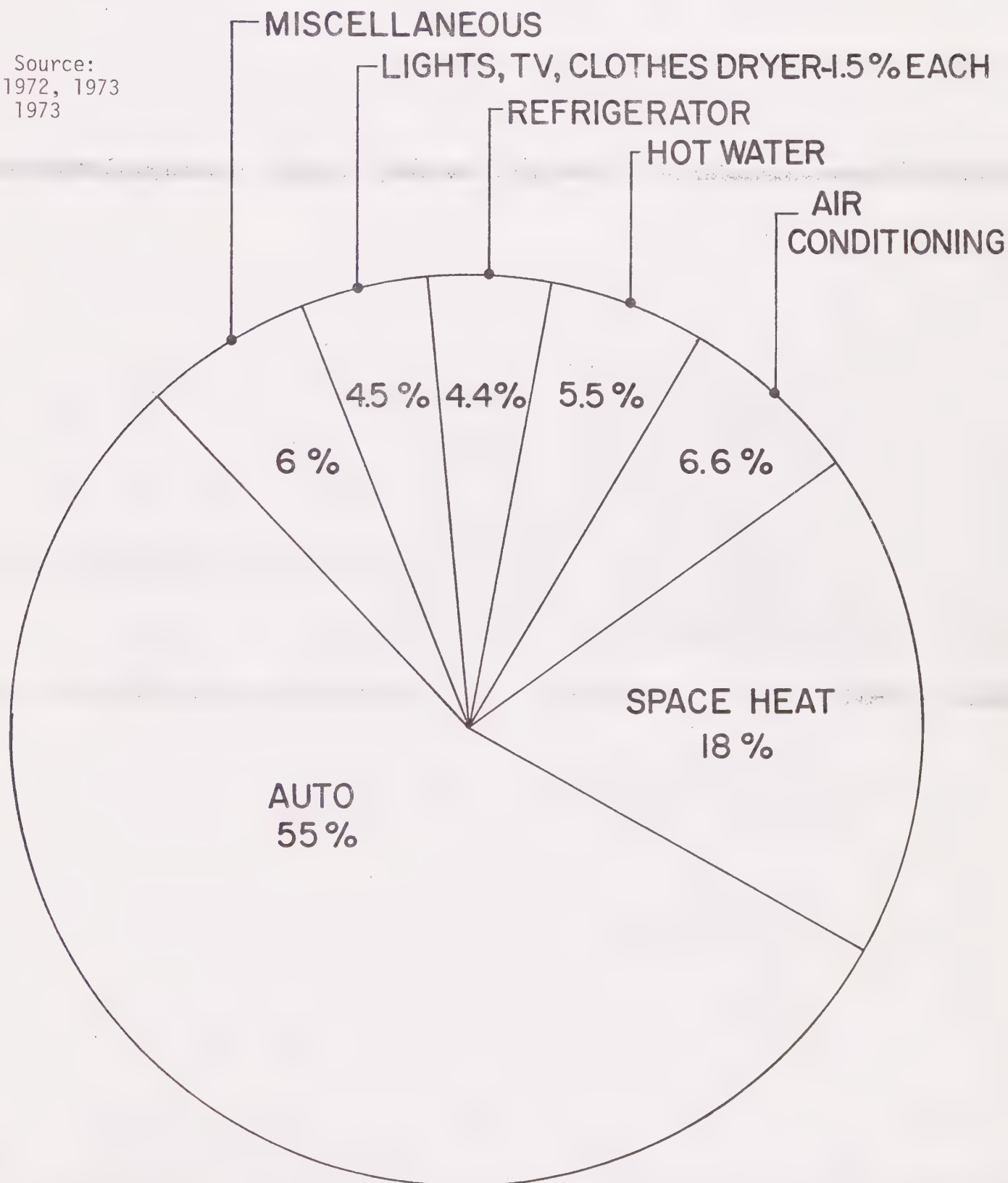
Data Source:
SRI 1972, 1973
Rand 1972



Personal Energy Use Pie

Electric Waste Heat Included

Data Source:
SRI 1972, 1973
Rand 1973



in the summer. Buildings may lack adequate insulation, caulking and weather stripping. Figure 5 shows the relative value of these factors for a typical house. Heat transmission rates in existing structures are also affected by the amount of surface area in windows and the color, orientation, shape and exposure of building surfaces.

Figure 6 show the average Livermore residential gas and electric consumption for the years 1973 - 1977. Gas consumption in the summer months is due to domestic hot water heating, pilot lights and ranges, and swimming pool heaters. The average gas consumption per dwelling in Livermore is about 100 therms/month, and electrical consumption is roughly 550 KWH/month. Residential usage accounts for 84% of Livermore's gas consumption and 62% of its electrical consumption.

Decorative lighting, advertising and display lights, exterior wall lighting, and other promotional uses, account for an average of 40% and in some cases, up to 60% of the electricity use in California for commercial and residential uses.

Appliances using both electricity and natural gas account for approximately 8% of the total national energy consumption. Water heaters alone use 4% of the national energy budget. Unfortunately, innovations in appliance technologies frequently result in more energy intensive appliances.

B. Alternate Energy Resources Potential

There are a number of alternate energy sources under consideration at the present time. Some of these (e.g., nuclear power) clearly could not be implemented by the City of Livermore, although their development could be supported in principle. Others such as solar energy, could, however, be incorporated into municipal utilities and buildings or residential and commercial structures. A brief summary of major alternate energy resources is given below.

Solar Energy is probably the most abundant and dispersed of all resources and has few environmental impact problems. Solar technology exists; however, current costs are not competitive except in special applications (e.g. swimming pool heaters).

Solid Waste potential is exploited in other parts of the world. Half of the 75 million tons of solid waste produced annually in California is collectable and can be converted to gas, oil, methanol, heat, etc. at a rate as high as 100 therms/ton.

Hydroelectric power accounts for more than one third of the electric power used in California (including imported electricity). For the future, hydroelectric power is expected to remain relatively constant since most acceptable sites have already been developed.

There are only a few nuclear power plants currently operating in California with additional licensing grants under consideration. This source could have a significant impact on future electrical power demands if safety and environmental problems are resolved.

Geothermal energy (underground heat) is now being used in Sonoma County at a cost which compares favorably with that of other energy sources. However, progress in realizing the development potential of California's geothermal resources will be slow because of prevailing technological, legal, institutional and environmental constraints.

Currently, there are environmental problems (e.g. air and water pollution) with the use of coal in power generation.

Wind energy is available in the hills surrounding Livermore on an intermittent basis. Technology exists to convert it to other forms of power (electrical and mechanical), but is not yet economical. Wind power may be of value in limited applications such as pumping water from wells.

III. Goals and Policies

A. Conservation

Energy conservation can extend the use of present resources and thereby allow more time to develop alternate resources and technologies. Conservation can be voluntary or mandatory. It is anticipated that both incentives for voluntary action and mandating ordinances will be needed. However, government policy should also include educating the public (including public school curricula) about what energy is, what it does, and what it costs--economically, socially and environmentally. Implementation of this element does not entail drastic changes in lifestyle or large environmental problems. The recommendations will generally be cost effective if acted on at the proper time.

Conservation measures can be considered in the following areas: land use, building design, appliances and transportation.

1. Land Use

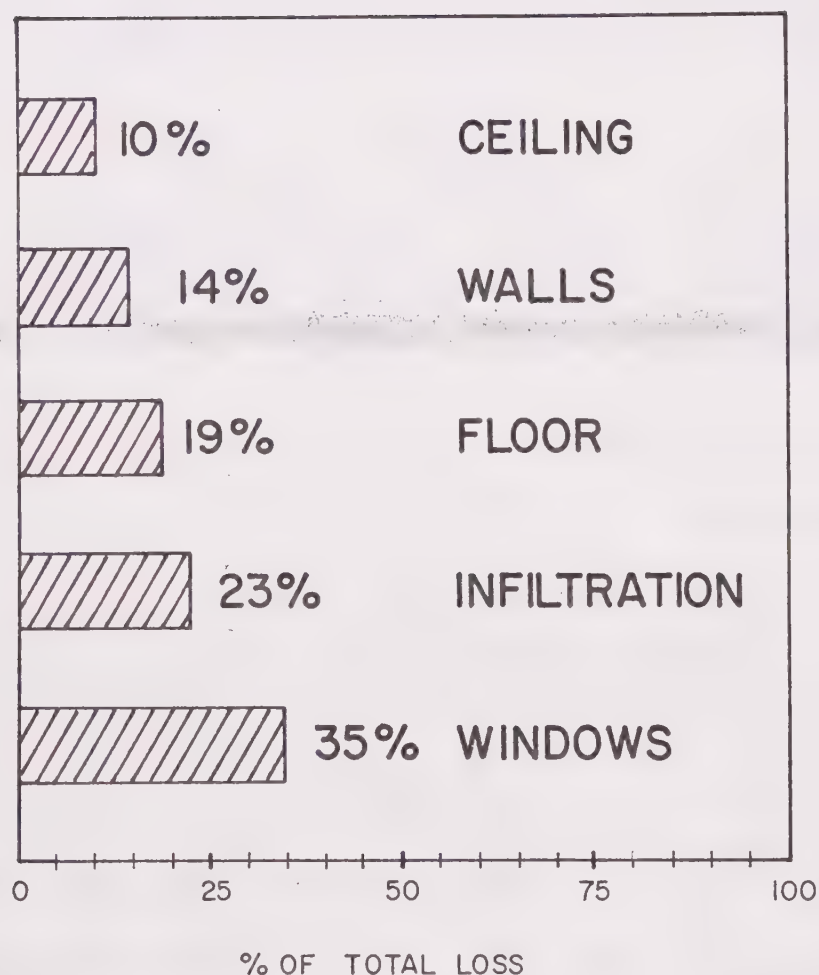
(a) Siting: Allowing flexibility in setbacks and setting minimum open space standards through Planned Unit Developments could encourage fuller use of land in residential and commercial developments, could reduce the surface area of a building exposed to hot or cold air, and could maximize southern exposure for passive solar heating in winter.

The need for automobile transportation can be minimized by proper land use planning. Some appropriate considerations include clustering multiple dwellings near neighborhood shopping centers, public transit planning, and emphasis on locating shopping in a central district.

(b) Landscaping: Large deciduous and long-lived trees planted on streets, parking lots, school yards, and on the western sides of buildings can ease heating and cooling demands.

2. Building Design

Buildings can be designed for more energy efficiency. Livermore



DISTRIBUTION OF LOSSES IN A 1200 FT² LIVERMORE HOME

- SLAB FLOOR
- R11 WALLS
- R19 CEILING
- .75 VOLUME AIR CHANGE PER HOUR
- 20% WINDOW AREA

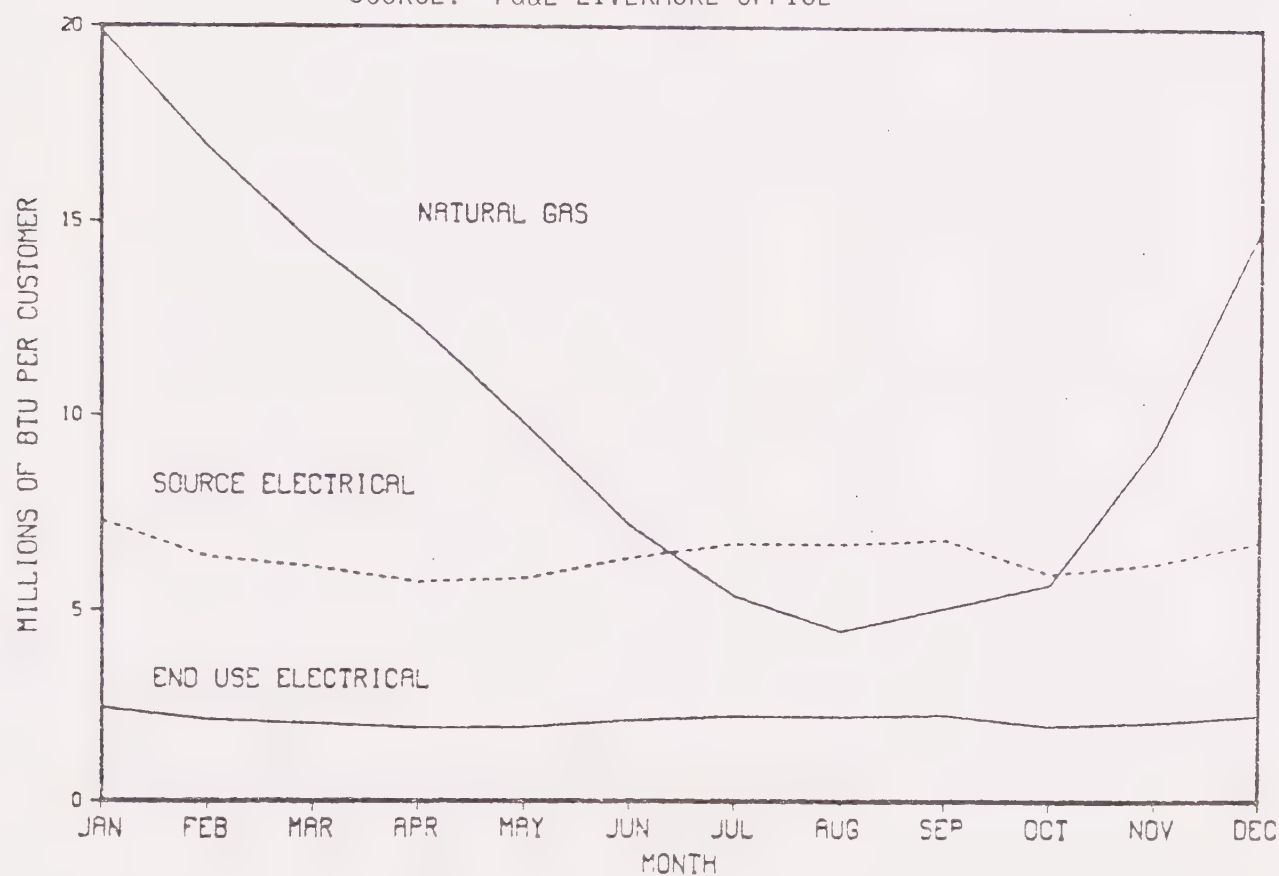
SOURCE: LIVERMORE INSULATION/ATTIC FAN STUDY

RESIDENTIAL ENERGY CONSUMPTION

LIVERMORE AREA

AVERAGE FOR PERIOD 1973-1977

SOURCE: PG&E LIVERMORE OFFICE



has hot dry summers and cool winters. Heating and cooling demands can be reduced if buildings are oriented in a north-south direction with overhangs or deciduous shading provided for the southern windows in summer. The sun is low enough in the winter so that its heat would provide some passive solar heating through south-facing window. Other features to consider when designing a building for energy efficiency are types of floors, wall, floor, and ceiling insulation, the color of the exterior roof and walls, the amount and type of glazing, the construction of windows to allow for lighting and summer ventilation needs, and the shape of the house to allow for good air (hot or cool) circulation.

Residential, commercial and industrial buildings and/or complexes (as well as schools) can be designed to maximize use of heat recovery systems and total energy systems.

3. Appliances

In the near future, State and Federal agencies will establish standards for minimum levels of operating efficiency for all appliances whose use requires a significant amount of energy. Labeling of appliances as to energy efficiency will also enable the public to make informed purchases and would encourage energy efficiency design by appliance manufacturers.

4. Transportation

Livermore can plan for pedestrian walkways, bicycle paths, and public transportation as alternatives to the automobile.

Bicycle use should be encouraged by requiring convenient parking facilities for bikes as a part of all appropriate development standards, as well as the construction and maintenance of attractive, functional, and safe bicycle lanes and paths.

Car and van pooling should be encouraged by cooperation with State agencies and various employers to develop and utilize pooling plans.

5. General

The City of Livermore and its citizens can subscribe to the basic conservation acts and procedures listed in Table 1. However, some require an expenditure of funds and must be justified economically, socially and/or environmentally to be attractive.

TABLE I

CONSERVATION ACTS AND PROCEDURES

1. Car pooling
2. Van pooling
3. Busing
Small cars
4. Drive at Reduced Speed
5. Building Changes
6. Landscaping
7. Insulate
 - a. Attic
 - b. Walls
 - c. Floor
 - d. Water Heaters
 - e. Ducts and Pipes
 - f. Storm Windows
8. Caulk and Weatherstrip
9. Thermostat Set-back
10. Restrict Hot Water Use
11. Reduce Lighting
12. Solar Heat Pools
13. Replace Appliances with more efficient units
 - a. More efficient Air Conditioners
 - b. More Efficient Furnaces
 - c. More Efficient Fans
 - d. More Efficient Freezers and Refrigerators
 - e. More Efficient Pool Heaters

B. Alternate Energy Resource Development and Utilization

Alternate energy sources will probably be developed almost exclusively at the Federal level (some at State level). Citizen action will impact this area mainly by influencing political representatives and voting in response to constitutional amendments, propositions and ordinances. City involvement in alternate resource development will probably be less than in direct conservation measures.

Of the several alternatives mentioned in Section II, only a few can be used by a municipality at this present time because of (a) lack of commercially available equipment, (b) poor operating economics, or (c) unprofitable use of the end product. Three alternatives could, however, be considered for implementation in the near term solar energy, recycling efforts and solid waste conversion.

1. Solar Energy

Solar energy should be considered for supplemental space heating and cooling and hot water heating in all new municipal buildings.

The City should also encourage the use of solar energy in the residential and commercial sectors, both in new construction and, where feasible, in retrofitting existing structures.

As noted in Section IIIA.2 (Building Design) heating and cooling demands can be reduced by proper building design, such as adequate insulation, double glazing and proper orientation. These features become essential if solar energy is employed.

A specific application where solar heating could make a significant energy saving would be in the heating of swimming pools. Our estimate, based on Pacific Gas & Electric data for Livermore, suggests a saving of about 20% of the total City gas consumption during a summer month, or enough gas to supply the annual needs of over 100 homes.

2. Recycling Materials

Recycling efforts indirectly affect energy usage in Livermore; they are not discernible as reduced PG&E power levels or in reduced gasoline sales. They do, however, strongly influence the State and National Energy balance, particularly if most communities would adopt active recycling programs. The added benefits of such a program are a reduction in the solid waste level, and conservation of natural resources.

3. Solid Waste Conversion

As mentioned earlier, solid waste can be converted into a number of usable forms of energy. The decision as to which fuel is derived depends on the quantities involved and their anticipated application.

For example, methane produced from organic wastes could augment natural gas supplies. Similarly, methanol derived from methane could be used to supplement gasoline in internal combustion engines. On a grander scale, conversion of the entire County's solid waste, which is presently buried in the nearby hills, might yield sufficient fuel to make it economically feasible to sell to Pacific Gas and Electric for electrical generation. Further studies would be needed to determine the most productive and cost-effective fuel process to apply in this area.

IV. Proposals

The City shall implement the above goals and policies in the following ways:

A. Conservation

1. Promote energy conservation education in schools and for the general public.

2. Establish energy conservation performance standards for new buildings where State has not pre-empted the field.

3. Where State has not pre-empted the field, continuously review and revise building codes and restrictions to assure that new structures have energy conserving features which are current state-of-the-art and cost effective.

4. Include energy conservation criteria in land use decisions.

5. Continuously review and revise zoning regulations and restrictions to assure that new developments have energy conserving features.

6. Undertake periodic review of City facilities (buildings, street lights, etc.), purchases and operating procedures with a view toward conserving energy on a long term as well as a day-to-day basis.

7. Consider mandating modifications to existing structures if significant and cost-effective energy savings can be achieved.

8. Promote those techniques of land use planning, e.g. clusters, which minimize the need for automobile transportation.

9. Promote and encourage alternative transportation modes such as car pooling, van pooling, public transport, and bikeways. Construction of new streets should be consistent with the utilization of these alternatives.

10. Establish a dialogue with and seek aid from nearby universities and government laboratories when required to determine the effectiveness of proposed conservation measures.

B. Alternate Energy Resources Development and Utilization

1. Encourage consideration of solar energy for space and hot water heating in residential and commercial buildings.

2. Consider the incorporation of solar energy for space and hot water heating in municipal buildings.

3. Restrict or prohibit gas and electric heaters for swimming pools, and encourage alternatives such as pool covers and solar heaters.

4. Determine the feasibility of a solid waste conversion system for use in Livermore either alone or in collaboration with nearby governmental entities.

5. Establish a dialogue with, and ask aid from, nearby universities and government laboratories to determine the feasibility of proposed alternate energy resources.

A POLICY OF THE CITY COUNCIL
CITY OF LIVERMORE, CALIFORNIA

REGARDING ENERGY CONSERVATION

WHEREAS, a city's energy supply is an important foundation for jobs, health, housing, recreation, and fire safety, and

WHEREAS, there has been a critical drought in California with reduced run-off for hydroelectric power generation, and

WHEREAS, use of fossil fuels to augment the power generated by hydroelectric facilities is increasing, and

WHEREAS, the supplies of oil and natural gas are diminishing,

NOW, THEREFORE, BE IT RESOLVED THAT THE CITY COUNCIL OF THE CITY OF LIVERMORE hereby proclaims that the 1977-78 year be one for public awareness and support for all forms of energy conservation in Livermore,

BE IT FURTHER RESOLVED that a conservation program be undertaken by the City to reduce the consumption of energy.

ALSO, BE IT FURTHER RESOLVED that the citizens of Livermore be strongly urged to observe the following rules to eliminate energy waste during 1977-78:

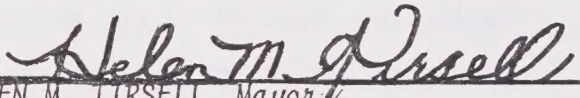
1. That nonessential outdoor use of energy, such as for decorative purposes, be eliminated.
2. That the use of energy for outdoor advertising be minimized.
3. That excessive interior lighting of business establishments be eliminated.
4. That interior heating of residences be limited to 65°F during active hours, and 55°F at night.
5. That interior heating of commercial and industrial establishments be limited to 65°F during business hours, and at a minimal level sufficient to prevent damage during nonbusiness hours.
6. That interior cooling of residences and business establishments be limited to 82°.
7. That heating of pools be maintained at the lowest usable temperatures, that the use of pool covers be required, and that solar heating be urged.
8. That pleasure driving be minimized, and that use of carpools be encouraged.
9. That building insulation in existing buildings be upgraded to present standards where possible.
10. That solar energy be applied where practical.

11. That recycling efforts be encouraged.

12. That all teachers throughout the Livermore Unified School District include energy efficiency concepts in their curriculum.

ALSO, BE IT FURTHER RESOLVED that we urge compliance and enforcement of PG&E Rule 14.1 on file with the Public Utilities Commission pertaining to prohibition, conservation and curtailment of energy use.

Dated: 1 August 1977


HELEN M. TIRSELL, Mayor

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